MEAT QUALITY OF AGED WETHERS

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SUMMARY

Forty-four 5 year old Merino wethers, from three different sources and purchased because they were typical of those used in the livesheep trade to the Middle East, were abattoir slaughtered. Meat and carcass quality measurements were taken post-slaughter. The wethers varied greatly in carcass dressing %, fat depth and carcass weight both between and within sources. Measurements of meat tenderness using Warner-Bratzler peak shear force values indicated variation between muscles and sources. Most of the ultimate pH values in the three muscles sampled were 'normal' with only 14% carcasses of carcasses classified "dark-cutting" (LD pH $\geq$ 6.0). These results indicate that the reported high incidence of dark-cutting meat in wethers slaughtered in the Middle East is not due to a propensity for 4-5 year old wethers to exhibit a dark-cutting carcass.

INTRODUCTION

Markets in the Middle East which receive meat from Australian sheep via the live sheep trade have complained of *poor* meat quality, particularly dark-cutting meat (Warner 1989; SAGRIC 1987). Dark-cutting (high pH) meat is known to have generally undesirable quality characteristics of a darker colour, a bland flavour, variable tenderness (tough to mushy) and reduced keeping quality, (Shorthose 1989) thus its occurrence in meat is undesirable, Tenderness, which is also an important consumer trait, is generally considered to be lacking in "mutton". Most of the sheep shipped to the Middle East, are 4-5 year old, cast-for-age, Merino wethers which have been bred for wool production, Sharaby and Suleiman (1988) reported on the carcass characteristics of Merino-cross wethers slaughtered in Saudia Arabia but little information is available on the meat quality of this type of sheep.

The aim of this study was to investigate the carcass and meat quality characteristics of wethers typical of those entering the live sheep trade at the time the sheep would normally be transferred in ownership from the farmer, i.e. at the time of entering the feedlot prior to live shipment to the Middle East.

MATERIALS AND METHODS

Three hundred and sixty 5 year old Merino wethers, from each of three different sources (source A, source B, source C) and purchased because they were typical of those used in the livesheep trade to the Middle-East, were delivered to the State Research Farm at Werribee in September 1988. Source A sheep were purchased from near Deniliquin, source B sheep from near Albury and source C sheep from near Kilmore. After arrival, every 25th sheep through a race was selected for slaughter. This gave a sample of 14-15 wethers per source, Animals were tagged, weighed and bled during drafting. The selected animals were immediately offered hay and water, and early the following morning were sent about 50 km by road to an abattoir. The sheep were slaughtered shortly after arrival.

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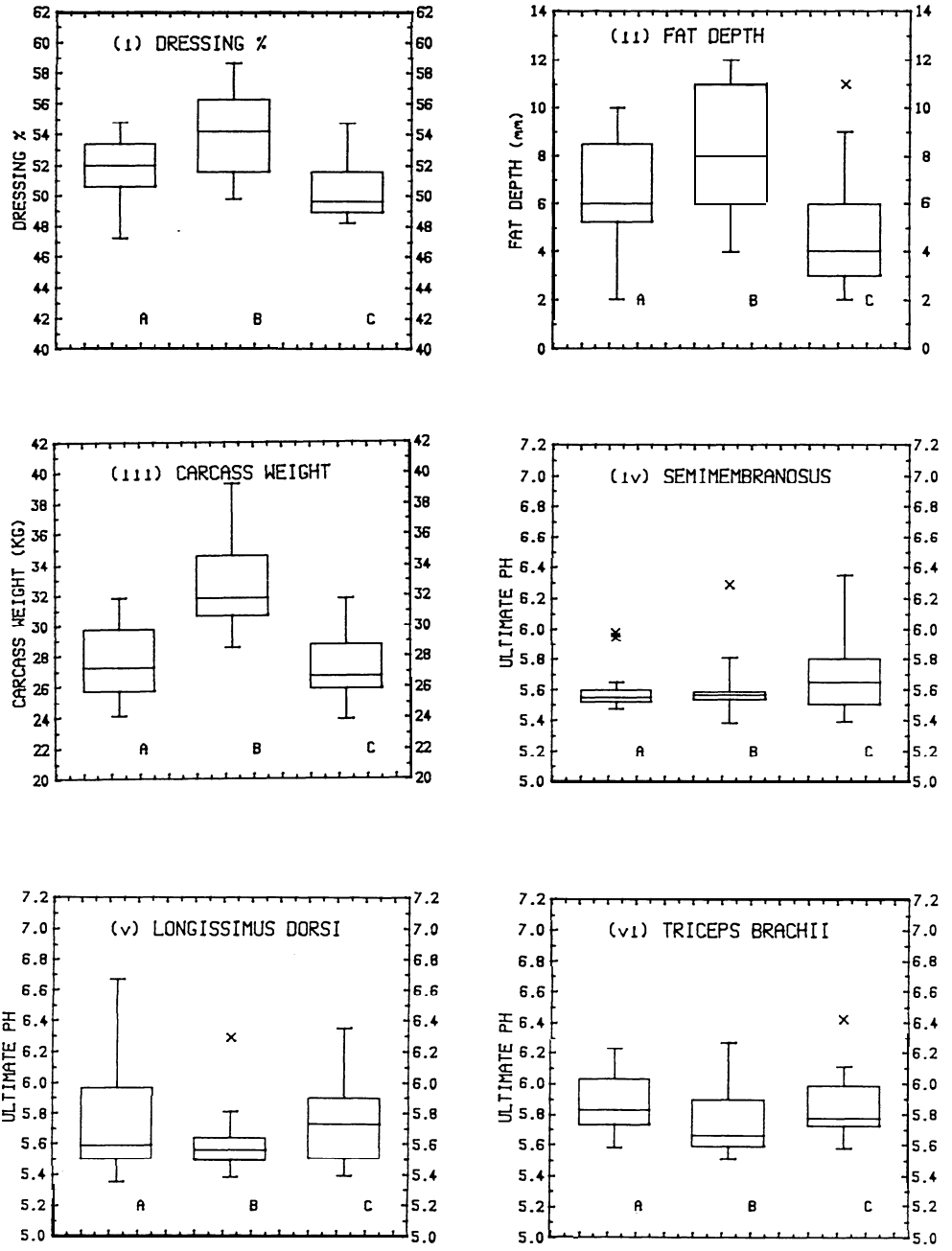

Fig- 1. **Box plots of carcass weight, fat depth, dressing % and meat ultimate pH for the muscles *longissimus dorsi*, *semimembranosus* and *triceps brachii* for sources A, B and C.**

After slaughter, the hot standard carcass weight after removal of kidneys, kidney fat and channel fat was recorded. The fat depth at the GR site was also recorded. The deep butt temperature decline in the chiller *over* 15 h was monitored in six carcasses using an Anritsu data logger and 6 121K temperature probes. At 24 h post-slaughter, ultimate pH measurements were made in 3 muscles *(longissimus dorsi-* LD, *semimembranosus-* SM and *triceps brachii-* TB) using a Jenco 6009 portable pH meter with automatic temperature compensation and an Ionode IJ20 spear electrode. A 100 g sample of the LD and SM was removed, chilled for 24 h at 4°C then frozen at −20°C for Warner-Bratzler measurements of tenderness. Samples were measured for Warner-Bratzler peak shear force after approximately 4 months of storage as described by Gaunt and Currie (1988).

A summary of the data distribution between animals, within each source, of each measurement is illustrated using box plots (Chambers *et al. 1983).* The box represents the interquartile range, the line extensions represent the range of the data (excluding extreme values), the cross bar within the box represents the median, and extreme observations are individually marked by *crosses,*

RESULTS

The range in carcass and meat measurements within and between sources of sheep is displayed in Fig. 1 and 2. The sheep varied greatly in dressing percent, fat depth and carcass weight both within and between sources, Sheep from source B generally produced heavier, fatter carcasses with a higher dressing percentage and sheep from source C produced lighter, leaner carcasses with a lower dressing percentage. The carcass characteristics of sheep from source A *were* intermediate.

The median ultimate pH values *were* similar between sources for the three muscles although the distribution of values showed some variation between sources as well as between muscles. The median ultimate pH values were similar for the SM and LD and highest for the TB for all sources. Six of the 44 carcasses (i.e. 14%) would be defined as dark-cutting (using an LD ultimate pH $\geq$ 6.0 as the cut-off). Only one carcass had an LD ultimate pH $\geq$ 6.4. The Warner-Bratzler peak shear force was about l-2 kg lower for the LD than for the SM (i.e. more tender) over the whole distribution of values. The median Warner-Bratzler peak shear force was higher (i.e. less tender) in the LD and SM from carcasses of source C. The deep butt temperature of the six carcasses measured ranged from 5.1 to 8.2°C at 7 h post-slaughter.

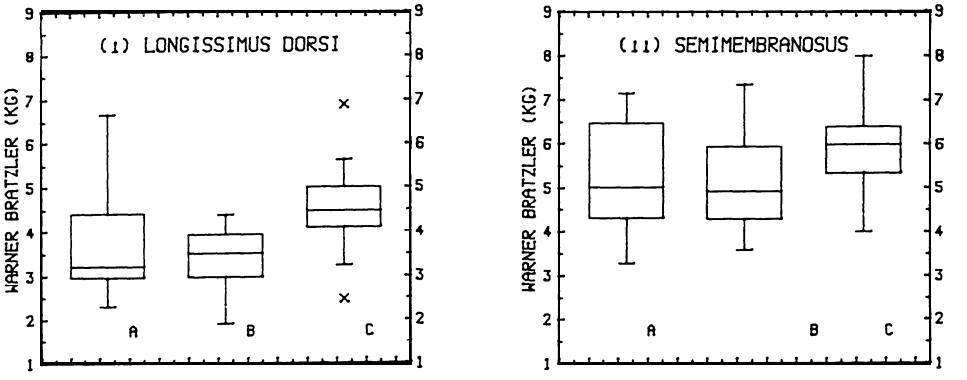

Fig. 2. Box plots for the Warner-Bratzler peak shear force for the muscles *longissimus dorsi* and *semimembranosus* for sources A, B and C

DISCUSSION

From this study it would appear that aged wethers arriving at a feedlot prior to live export to the Middle East can have a large variation in condition (fat depth, weight and subsequent carcass dressing %) both within and between sources. These animals tended to be heavier and have a *lower* dressing percentage than the carcasses of younger sheep reported by Sharaby and Suleiman (1988). They slaughtered 24-month Merino crosses in Saudi Arabia (mean carcass weight = 27.1 kg, s.e. = 0.97; mean dressing percentage = 56.3%, s.e. = 1.21).

The SM and LD are classed as 'white' muscles histochemically and naturally have a lower ultimate pH than red muscles such as the TB (Devine and Chrystall 1989) and as exhibited in this study. The pHu is, by convention, used to define a 'dark-dutting' (DC; pHu>6.0) carcass (Shorthose 1989). Using this definition, 14% of the carcasses in this study *were* DC which is not different to that reported by Shorthose (1989) for lambs (15%). Bouton et *al.* (1978) reported that samples of beef with a Warner-Bratzler peak shear force > 6.6 kg were considered tough by a trained taste panel. Using this criteria, the median Warner-Bratzler peak shear force for the two muscles sampled was within acceptable tenderness limits although some samples, particularly from source C, would be considered tough, The temperature decline recorded post-slaughter combined with the leaner carcasses from source C suggest that cold-toughening occurred in some muscles. As most carcasses are not refrigerated post-slaughter in the Middle East, it is not envisaged that cold-shortening would be a problem.

This experiment has provided evidence that the reported high incidence of dark-cutting meat in wethers slaughtered in the Middle East is not due to a propensity for 4-5 year old wethers to exhibit a dark-cutting carcass but is most probably due to management of the sheep after transfer of ownership from the farmer. Many factors have been implicated in the dark-cutting condition including undernutrition (Devine and Chrystall 1989), disease, climatic stress and handling stress (Shorthose 1989). These factors require further investigation to elucidate the problem.

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